FEEDING OF THE ADELIE PENGUIN *PYGOSCELIS ADELIAE*

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ABSTRACT

A two month study of the feeding of the Adelie penguin, *Pygoscelis adeliae*, was carried out at Cape Bird, Ross Island, Antarctica, during the austral summer of 1973-1974. Adelie penguins fed predominantly on the euphausid, *Euphausia crystallorophias*, fish and Amphipoda. Invertebrates ingested were between 14 and 41 mm total length and most fish taken were less than an estimated 75 mm total length.

INTRODUCTION

The food of the Adelie penguin, *Pygoscelis adeliae* (Hombron and Jacquinot 1841), has been recorded by Wilson 1904, Levick 1915, Bellingshausen 1945, Eklund 1945, Sladen 1958, and Emison 1968 (Table 1). Most of the information given is of a general nature, with the exception of that provided by Emison who made detailed stomach content analyses of birds from Cape Crozier.

The present study was carried out during the austral summer of 1973-1974 at Cape Bird, Ross Island, Antarctica (77° 13'S, 166°27'E). Diet composition and prey size were investigated.

METHODS

Fifteen stomach samples were collected from adult birds returning to the rookery from Ross Sea fishing grounds. Of these, eight were the stomach contents of birds severely injured by the leopard seal, *Hydruga leptonyx*. The remaining seven were partial stomach contents collected with a stomach pump, using the method of Emison (1968). Stomach contents were weighed to the nearest gram and placed in 10% neutral formalin. Later, intact food organisms were sorted from the samples, identified and measured. Undigested but incomplete organisms were also identified where possible. Numbers of euphausids, amphipods and fish present were estimated by counting eyes, exoskeletons and eye lenses respectively. The volume of food organisms was determined by measuring their displacement in water. Total lengths of euphausids and amphipods were measured from the tip of the rostrum to the tip of the telson. All fish found were partially digested; hence their sizes could not be measured but were estimated on the basis of eye lens diameter (Ainley and Emison 1972).

TABLE 1. FOOD OF THE ADELIE PENGUIN, RECORDED IN THE LITERATURE.

Author	Locality	Author's comments
Wilson 1907	Cape Adare	"... almost entirely *Euphausia superba* ..."
	Cape Royds	"... small fish, cephalopods, *Euphausia* and other crustaceans..."
Levick 1915	Cape Adare	"... *Euphausia*, on which the Adelies entirely subsisted..."
Bellingshausen 1945	Weddell Sea	"Practically the only food... is a small reddish crustacean, *Euphausia*..."
Eklund 1945	East Base	"food... consists chiefly of a small transparent fish (Nototheniidae) and the Opossum Shrimp (*Euphausia superba*) ..."
Sladen 1958	Graham Land and South Orkneys	"... *Euphausia* remains in excreta..."
Emison 1968	Ross Sea region	*Euphausia* 90-95% by number, 60% by volume Fish 4-8% by number, 39% by volume Amphipoda <2% by number, <1% by volume Common species are *Euphausia crystallorophias* (euphausid) and *Pleurogramma antarcticum* (fish)

RESULTS

Diet composition varied considerably from bird to bird, and because only 15 stomachs were examined during the 2-month period, seasonal differences could not be established. All samples have been combined in Table 2 to give an indication of the relative percentages of different food items consumed by the Adelies.

TABLE 2. COMPOSITION OF THE DIET OF 15 ADELIE PENGUINS TAKEN AT CAPE BIRD.

Food items	Number of individuals	Percent total number	Percent volume
Euphausiacea	14 466	75	46
Fish	4 295	22	44
Amphipoda	518	3	10

Euphausia crystallorophias, the only euphausid taken, was the major food item found. Fish constituted the second-most abundant group, and although at least two species were present only *Pleuragramma antarcticum* was positively identified. Amphipods were the least common food items. Four species, *Hyperia*

macrocephala, Cheirimedan femoratus, Eusirus antarcticus and *Epimeriella macronyx* occurred in all but three of the stomachs, whereas a fifth species, *Paramoera walkeri,* was recorded once. The stomach contents of the bird containing *P. walkeri* weighed 25 g, and consisted solely of that species and small stones.

Incidental items recorded in the diets of Adelies were a bivalve mollusc *Yoldia eightsii,* egg shell fragments and small stones. Cestodes occurred in several of the stomachs containing fish remains, and may have been released from fish as they were digested.

Euphausids taken by male and female penguins were almost identical in size: males took euphausids in the size range 14-41 mm (mean = 29 mm, n = 111), females 14-39 mm (mean = 28.9, n = 282). Ninety-five percent of the fish had an eye lens diameter of less than 2 mm, which corresponds to a total body length of less than 75 mm (Ainley and Emison 1972). All amphipods ingested by Adelies were between 14 and 41 mm total length.

DISCUSSION

Adelie penguins in most parts of Antarctica feed almost exclusively on *Euphausia superba.* As *E. superba* is absent in the Ross Sea region (Marr 1962), penguins must feed on alternative foods. This study has shown that they eat *E. crystallorophias,* supplemented by fish and amphipods. In a study at Cape Crozier, Ross Island, Emison (1968) noted that euphausids consituted 60% by volume of the diet of Adelies, compared with a mean volume of 46% in this study. Of this 60%, 99% were *E. crystallorophias* and 1% *E. superba,* the latter possibly having been swept into the Ross Sea from large oceanic populations. Fish were the second most important food item of Adelies at both Ross Island and Cape Bird, and the position of the fish in the anterior part of dissected stomachs suggested that perhaps all the fish were encountered immediately before the penguins returned to the rookery.

Amphipods were the only other prey items found. At Cape Crozier they formed only 1% of total food volume although 14 species occurred (Emison 1968), whereas at Cape Bird five species constituted 10% by volume. Amphipods were distributed amongst other food items in the penguins' stomachs. This suggests that they were not being specifically selected, but rather were ingested incidentally with euphausids and fish.

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